

Relationship Between Ex-vessel Value and Size Composition of Annual Landings of Shrimp From the Gulf and South Atlantic Coasts

CHARLES W. CAILLOUET, DENNIS B. KOI, and WILLIAM B. JACKSON

Introduction

Caillouet and Patella (1978) and Caillouet et al. (1979) compared the commercial shrimp fisheries of the states bordering the Gulf of Mexico using average annual ex-vessel value per pound for reported annual catches of brown shrimp, *Penaeus aztecus*, pink shrimp, *P. duorarum*, and white shrimp, *P. setiferus*. They compared these fisheries because the fisheries are regulated by different state laws (Christmas and Etzold, 1977), resulting in different harvesting strategies that affect the size distributions and therefore the value of shrimp harvested within each state.

For 1959-75, Caillouet and Patella (1978) and Caillouet et al. (1979) showed that the average annual ex-vessel value per pound (expressed in dollar units based on the year 1975) for reported annual catches ranged from a high of \$2.22 for brown shrimp in Texas to a low of \$1.36 for the same species in Louisiana (Table 1). The average annual ex-vessel value per pound for pink and white shrimp fell within this range. Differences among states in

average annual ex-vessel value per pound were attributed primarily to differences in size composition of the catches. Large shrimp commanded higher prices than did small shrimp on the market, so when a large proportion of the reported catch was made up of small shrimp (e.g., in Louisiana), the ex-vessel value per pound for that catch was lower than that of a catch of equal weight in which a smaller proportion was made up of small shrimp (e.g., in Texas).

In this paper we employ analyses

Table 1.—Average annual ex-vessel value per pound (heads-off; expressed in 1975 dollar units) of reported annual catches of brown, pink, and white shrimp from five regions of the U.S. coast of the Gulf of Mexico, 1959-75.¹

Region	Brown shrimp (\$/lb)	Pink shrimp (\$/lb)	White shrimp (\$/lb)
Texas coast	2.22	2.07	— ²
Mississippi River to Texas	1.36	1.75	—
Pensacola to Mississippi River	1.55	1.97	—
Appalachicola	—	—	1.52
Sanibel to Tortugas	—	—	1.56

¹Adapted from Caillouet and Patella (1978) and Caillouet et al. (1979).

²Not determined. Calculations were made only for the dominant species in each region.

ABSTRACT—The relationship between ex-vessel value and size (number of shrimp per pound, heads-off) composition of annual landings of brown shrimp, *Penaeus aztecus*, pink shrimp, *P. duorarum*, and white shrimp, *P. setiferus*, from the Gulf and south Atlantic coasts of the United States was determined. Average annual ex-vessel value per pound, expressed in dollar units based upon 1975 and 1977, was used to compare the landings from the two coasts.

Regional differences in price structure and size composition of the annual landings played large roles in determining the ex-vessel value of a given weight of landings. The average annual ex-vessel value per pound for brown and white shrimp was higher on the south Atlantic coast than on the Gulf coast. For pink shrimp, the average annual ex-vessel value per pound was lower on the south Atlantic coast than on the Gulf coast.

The authors are with the Southeast Fisheries Center Galveston Laboratory, National Marine Fisheries Service, NOAA, 4700 Avenue U, Galveston, TX 77550. This paper is Contribution No. 80-42G from the Southeast Fisheries Center Galveston Laboratory, National Marine Fisheries Service, NOAA, Galveston, Tex.

similar to those used by Caillouet and Patella (1978) and Caillouet et al. (1979) to compare the average annual ex-vessel value per pound for reported annual landings of brown, pink, and white shrimp from Gulf and south Atlantic coasts of the United States for 1961-77. Shrimp fisheries of the Gulf coast of the United States have been described by Christmas and Etzold (1977), and those of the south Atlantic coast of the United States have been described by Calder et al. (1974). Gunter and McGraw (1973) have investigated correlations among the annual landings of brown and white shrimp from the Gulf and south Atlantic coasts.

Description of Data

Landings statistics for 1961-69 were obtained from the U.S. Fish and Wildlife Service (1962-71), those for 1970-76 were obtained from the National Marine Fisheries Service (1971-78), and unpublished computer printouts of landings statistics for 1977 were obtained from Richard L. Schween¹. Reported annual landings were expressed in pounds (heads-off), and ex-vessel value in dollars, by year (1961-77), coastal area (Gulf and south Atlantic coasts), species (brown, pink, and white shrimp), and size category, commonly referred to as "count" (number of shrimp per pound, heads-off, including the categories <15, 15-20, 21-25, 26-30, 31-40, 41-50, 51-67, ≥68, and "pieces"). These landings constituted combined inshore and offshore catches landed by domestic fishermen at domestic ports in each coastal area, for shrimping trips completed within each year.

Analytical Methods and Results

Using data for 1975 and 1977, we first divided dollars by pounds in each

¹Richard L. Schween, Resource Statistics Division, National Marine Fisheries Service, NOAA, Washington, D.C., pers. commun. January 1979.

size category to obtain the annual price structure of the landings (i.e., ex-vessel value per pound by size category) for

each species and both coasts (Table 2). We chose dollar units for 1975 so that our results could be compared with

those of Caillouet and Patella (1978) and Caillouet et al. (1979), and we chose dollar units for 1977 because 1977 was the latest year for which data were available. Using the annual price structures for 1975 and 1977, we then multiplied ex-vessel value per pound by the reported pounds landed in each size category, for each species, both coastal areas, and the years 1961-77. Summation over size categories provided estimates of annual ex-vessel value (both in 1975 and 1977 units) of the reported annual landings by coastal area, species, and year.

A straight line was fitted by least squares through the origin and through data points representing estimated annual ex-vessel value and reported annual landings, one line for each combination of coastal area, species, and dollar unit basis (1975 and 1977). The slope of each line represented average annual ex-vessel value per pound, based on the entire time series, 1961-77 (Table 3; Fig. 1-12). Coefficients of determination (r^2) were also calculated for each fitted line.

Unlike the Gulf coast, the south Atlantic coast contained no landings in the <15 size category for most years and species (Tables 4-9). For this reason, dollars per pound in the <15 size category could not be calculated for

Table 2.—Price structure (ex-vessel value per pound, heads-off, by size category) of reported annual landings of brown, pink, and white shrimp from Gulf and south Atlantic coasts of the United States in 1975 and 1977 (based on National Marine Fisheries Service, 1976, and Richard L. Schween, pers. commun., January 1979).¹

Size category (count) No./lb ²	Brown shrimp				Pink shrimp				White shrimp			
	Gulf coast		S. Atlantic coast		Gulf coast		S. Atlantic coast		Gulf coast		S. Atlantic coast	
	1975 \$/lb	1977 \$/lb	1975 \$/lb	1977 \$/lb	1975 \$/lb	1977 \$/lb	1975 \$/lb	1977 \$/lb	1975 \$/lb	1977 \$/lb	1975 \$/lb	1977 \$/lb
≤15	2.86	4.34	ND ³	3.65	2.65	3.63	ND	4.27	2.93	4.14	ND	ND
15-20	2.74	3.57	2.52	3.25	2.34	3.47	2.97	3.55	2.85	3.54	2.90	3.03
21-25	2.73	2.88	2.56	2.85	2.19	3.21	2.43	3.11	2.78	2.87	2.81	2.61
26-30	2.50	2.67	2.40	2.65	2.04	2.76	2.34	2.85	2.52	2.56	2.45	2.41
31-40	2.13	2.16	1.98	2.17	1.82	2.36	1.74	2.05	2.12	2.09	2.27	2.18
41-50	1.66	1.62	1.57	1.62	1.46	1.66	1.38	1.59	1.63	1.62	1.72	1.81
51-67	1.32	1.27	1.22	1.31	1.23	1.34	1.22	1.28	1.25	1.27	1.37	1.46
≥68	0.59	0.76	0.98	0.94	0.64	0.96	1.06	1.01	0.68	0.79	0.89	1.04
Pieces	0.88	1.06	ND	ND	0.74	1.40	ND	ND	0.63	0.93	ND	ND

¹Values in this table were rounded to hundredths, but additional significant digits were carried in calculations described in this paper.

²Heads-off.

³ND = no data. No landings were reported in the "pieces" category for all three species in 1975 and 1977 on the south Atlantic coast. For all three species in 1975 and 1977, landings were reported in the "pieces" category on the Gulf coast.

Table 3.—Average annual ex-vessel value per pound (heads-off; expressed in 1975 and 1977 dollar units) of reported annual landings of brown, pink, and white shrimp from Gulf and south Atlantic coasts of the United States (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).¹

Region	Brown shrimp		Pink shrimp		White shrimp	
	\$/lb (1975 units)	\$/lb (1977 units)	\$/lb (1975 units)	\$/lb (1977 units)	\$/lb (1975 units)	\$/lb (1977 units)
Gulf coast	1.79 (0.945)	1.98 (0.931)	1.69 (0.982)	2.21 (0.967)	1.83 (0.957)	1.97 (0.948)
South Atlantic coast	1.93 (0.936)	2.11 (0.915)	1.45 (0.900)	1.63 (0.834)	2.10 (0.960)	2.08 (0.971)

¹Coefficients of determination, r^2 , are shown in parentheses. For least squares lines through the origin, r^2 was calculated as follows: $r^2 = 1 - (s^2_{\text{reg}}/s^2_{\text{val}})$ where s^2_{reg} is the variance due to regression, and s^2_{val} is the variance in ex-vessel value of the reported annual landings.

Table 4.—Percentage of weight (heads-off), by size category, of reported annual landings of brown shrimp from the Gulf coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	5.2	14.1	12.7	11.8	26.4	10.2	7.2	12.4
1962	4.4	13.7	11.9	8.0	17.1	12.7	8.7	23.5
1963	3.5	14.0	11.3	10.6	25.2	9.7	8.6	17.0
1964	5.2	14.5	13.0	10.0	20.1	9.5	13.7	13.9
1965	2.6	10.1	13.9	10.4	19.1	11.6	12.7	19.6
1966	3.0	10.9	15.1	10.0	20.3	8.4	9.1	23.2
1967	1.5	8.2	13.6	13.2	24.3	8.9	9.8	20.5
1968	1.9	7.8	11.0	10.3	21.9	11.0	11.6	24.5
1969	2.4	10.1	11.4	8.5	15.9	10.5	12.1	29.1
1970	2.1	11.8	13.5	10.3	19.8	7.7	11.9	22.9
1971	2.4	8.9	9.4	9.8	21.2	12.7	9.4	26.2
1972	1.8	8.5	13.2	10.4	23.3	10.2	11.5	21.1
1973	2.5	11.4	8.9	7.9	17.3	11.1	11.1	29.7
1974	1.8	10.9	13.6	10.5	20.3	8.2	8.4	26.2
1975	1.7	10.4	12.2	8.8	18.2	10.8	12.7	25.2
1976	1.5	8.7	9.6	9.1	17.9	8.1	11.4	33.8
1977	0.9	5.2	11.0	9.8	19.2	10.1	14.9	29.0

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

Table 5.—Percentage of weight (heads-off), by size category, of reported annual landings of pink shrimp from the Gulf coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	0.2	4.7	21.5	19.1	25.9	10.7	7.6	10.3
1962	0.3	9.6	11.2	17.1	31.3	16.5	8.7	5.2
1963	0.3	3.7	13.1	14.7	28.7	16.3	12.8	10.4
1964	0.3	6.0	9.2	12.0	30.5	20.0	13.2	8.7
1965	0.5	6.7	11.8	13.1	29.1	18.2	13.5	7.0
1966	1.0	5.0	10.4	12.5	26.3	17.7	18.5	8.7
1967	1.9	6.2	9.9	13.6	27.8	17.2	18.2	5.3
1968	1.0	6.4	14.0	15.1	28.3	14.0	16.9	4.2
1969	1.3	4.6	11.1	14.3	25.5	16.1	21.8	5.2
1970	0.4	4.2	9.6	12.6	25.3	15.2	22.9	9.8
1971	0.8	7.6	13.0	15.1	19.0	16.7	22.6	5.2
1972	0.9	10.4	14.8	13.8	21.1	15.6	20.5	3.1
1973	0.7	5.7	10.0	15.4	25.2	11.3	27.6	4.1
1974	0.7	6.4	12.7	16.0	22.3	14.4	23.7	3.9
1975	0.4	6.9	11.7	13.0	22.2	12.5	28.1	5.1
1976	1.2	8.0	10.4	14.2	21.3	13.3	26.8	4.7
1977	0.8	5.3	7.3	10.2	20.2	14.1	33.4	8.7

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

Table 6.—Percentage of weight (heads-off), by size category, of reported annual landings of white shrimp from the Gulf coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	0.6	12.9	17.2	11.0	17.8	11.0	15.6	13.9
1962	0.4	9.0	9.6	8.6	16.9	11.5	20.2	23.8
1963	0.2	6.5	9.6	12.5	21.9	12.4	20.5	16.5
1964	1.2	14.2	14.6	11.5	20.1	11.3	12.3	14.8
1965	2.4	16.9	10.1	7.6	15.6	10.3	14.1	23.1
1966	2.6	13.0	10.8	7.9	14.3	8.2	22.1	21.0
1967	3.5	18.8	15.7	9.5	15.5	8.1	11.4	17.6
1968	2.6	10.9	13.2	11.1	16.6	8.1	16.5	21.1
1969	1.5	10.5	11.7	11.4	18.9	8.8	14.2	23.0
1970	2.1	12.9	16.4	12.3	15.5	8.1	11.2	21.5
1971	3.1	10.4	13.0	10.6	16.7	9.6	12.9	23.8
1972	3.2	12.2	11.6	9.0	16.6	8.6	11.1	27.8
1973	1.9	8.1	7.1	8.5	19.1	9.0	15.4	30.9
1974	4.0	12.8	12.8	8.6	13.6	6.6	11.2	30.3
1975	2.7	11.5	10.5	8.3	15.0	6.9	10.2	34.9
1976	2.7	9.6	13.7	11.8	15.5	6.8	12.8	27.2
1977	1.6	7.3	11.5	10.8	16.7	7.3	13.7	31.3

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

Table 7.—Percentage of weight (heads-off), by size category, of reported annual landings of brown shrimp from the south Atlantic coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	0.0	4.8	7.7	30.9	31.3	15.0	8.0	2.2
1962	0.0	2.0	9.1	15.8	36.0	20.9	12.3	3.9
1963	0.0	6.5	8.0	17.3	40.4	20.9	5.8	1.3
1964	0.0	5.6	12.1	28.2	40.6	8.5	4.4	0.6
1965	0.2	0.6	6.5	18.0	37.3	26.1	10.6	0.6
1966	0.0	0.1	16.1	22.8	32.4	17.3	10.3	1.0
1967	0.0	6.0	7.1	13.6	42.8	24.0	6.5	0.0
1968	0.0	5.4	19.6	30.8	30.3	8.3	5.0	0.6
1969	0.0	4.7	17.0	16.5	40.4	13.7	7.0	0.6
1970	0.0	5.3	15.0	28.1	34.2	11.2	5.0	1.1
1971	0.0	2.4	17.8	13.9	32.9	20.1	10.6	2.2
1972	0.0	0.7	12.0	16.8	34.8	20.1	13.2	2.4
1973	0.0	0.7	8.1	14.9	38.4	18.1	17.4	2.4
1974	0.0	0.5	2.7	5.6	27.5	43.4	15.1	5.3
1975	0.0	0.7	3.2	10.2	40.3	25.0	17.6	2.9
1976	0.0	0.5	6.4	10.1	30.3	26.5	22.3	4.0
1977	0.0	5.8	11.0	20.6	34.1	20.2	7.2	1.1

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

³These categories contained small percentages not apparent due to rounding.

Table 8.—Percentage of weight (heads-off), by size category, of reported annual landings of pink shrimp from the south Atlantic coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	0.0	4.3	2.5	5.2	21.2	27.4	24.9	14.5
1962	0.0	3.6	12.6	9.5	13.9	22.5	23.7	14.2
1963	0.0	14.6	8.0	11.6	19.2	26.1	12.8	7.7
1964	0.0	5.0	7.3	10.7	32.1	20.0	22.7	2.1
1965	0.0	0.0	0.0	0.0	6.6	81.8	11.3	0.4
1966	0.0	0.0	0.1	0.2	0.4	52.8	46.4	0.1
1967	0.0	3.2	0.0	0.0	32.1	64.3	0.4	0.0
1968	0.0	1.8	8.3	1.7	20.5	43.0	24.7	0.0
1969	0.0	1.3	4.6	4.3	20.7	41.7	27.3	0.0
1970	0.0	0.3	1.3	11.5	28.9	46.4	11.6	0.0
1971	0.0	0.0	0.0	2.7	15.9	27.1	43.1	11.2
1972	0.0	0.0	0.0	0.8	22.8	39.0	26.6	10.9
1973	0.0	0.3	0.2	3.5	16.1	38.5	29.2	12.1
1974	0.0	0.1	0.1	0.0	0.1	13.3	71.0	15.2
1975	0.0	0.8	0.7	0.7	4.0	15.7	58.4	19.7
1976	0.0	0.6	0.2	1.9	5.0	26.9	50.8	14.6
1977	0.1	6.8	11.5	2.1	21.2	16.6	29.0	12.7

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

³These categories contained small percentages not apparent due to rounding.

Table 9.—Percentage of weight (heads-off), by size category, of reported annual landings of white shrimp from the south Atlantic coast, 1961-77¹ (based on U.S. Fish and Wildlife Service, 1962-71, National Marine Fisheries Service, 1971-78, and Richard L. Schween, pers. commun., January 1979).²

Year	Number of shrimp per pound							
	<15	15-20	21-25	26-30	31-40	41-50	51-67	≥68
1961	0.0	3.5	20.1	24.3	26.2	12.7	7.5	5.7
1962	0.0	0.8	9.7	21.8	27.5	19.4	14.7	6.0
1963	0.0	4.4	17.8	20.2	28.6	17.1	9.0	2.8
1964	0.0	3.1	22.1	22.3	24.7	13.5	11.0	3.2
1965	0.0	2.6	15.2	18.1	30.4	20.9	11.1	1.7
1966	0.0	1.2	21.0	16.9	29.1	15.5	10.3	6.0
1967	0.0	1.7	17.7	31.6	29.0	14.5	5.0	0.5
1968	0.0	1.3	15.1	29.5	27.1	16.2	10.2	0.7
1969	0.0	0.2	9.0	20.0	33.0	19.4	15.1	3.4
1970	0.0	1.0	23.3	23.0	29.5	14.0	7.3	2.0
1971	0.0	1.4	15.5	16.2	25.7	18.9	17.1	5.3
1972	0.0	0.8	7.5	19.8	28.1	17.1	20.0	6.5
1973	0.0	1.0	8.5	20.0	23.3	20.2	20.8	6.3
1974	0.0	1.4	13.2	21.2	30.3	15.7	13.1	5.2
1975	0.0	0.6	11.4	23.2	25.6	14.1	19.1	6.0
1976	0.0	0.3	10.6	19.4	23.6	14.2	21.9	9.9
1977	0.0	7.9	43.4	24.6	16.1	5.1	2.5	0.4

¹Rows may not sum to 100 percent due to rounding.

²Data for 1977 were obtained from unpublished computer printouts.

³These categories contained small percentages not apparent due to rounding.

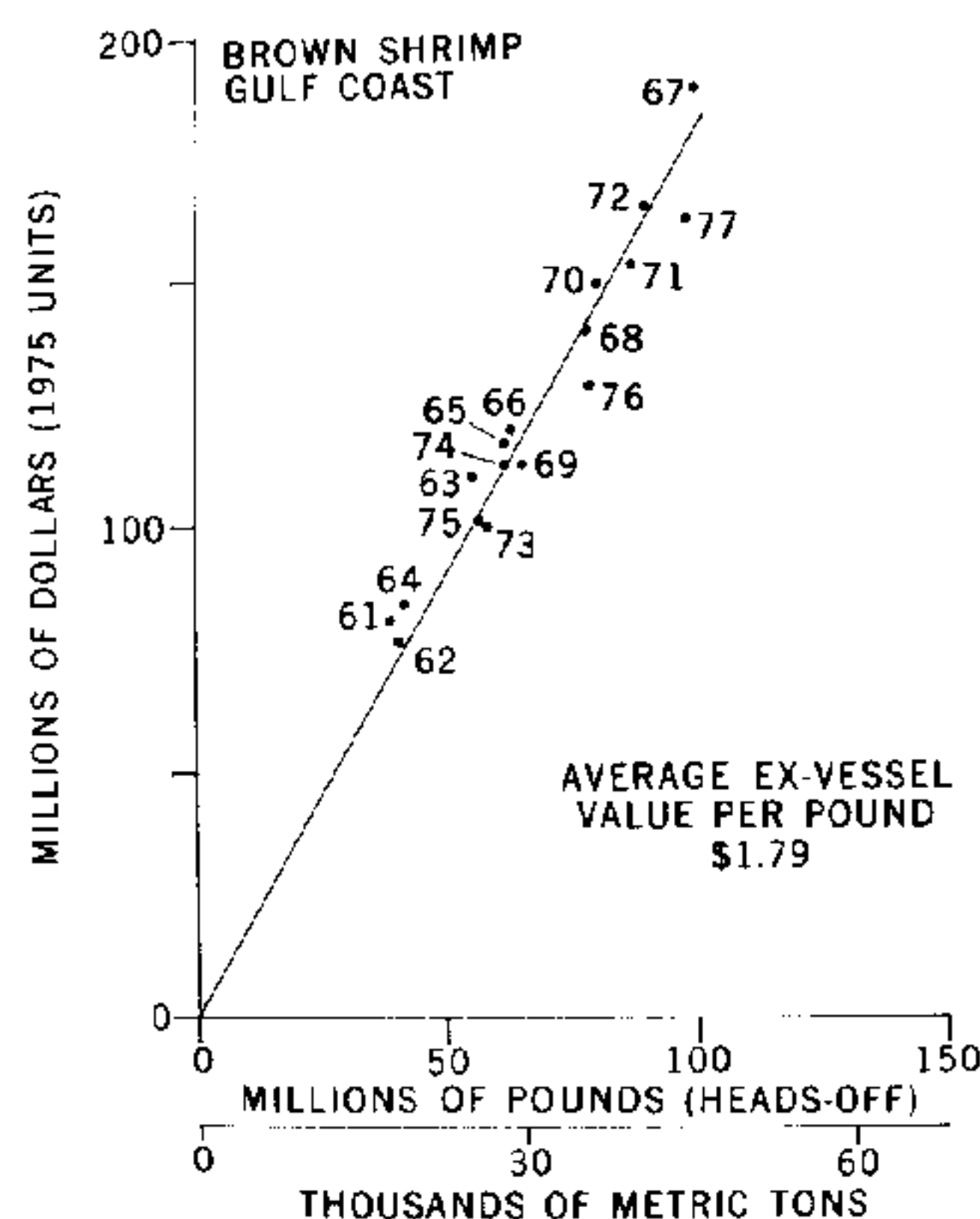


Figure 1.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of brown shrimp from the Gulf coast, 1961-77.

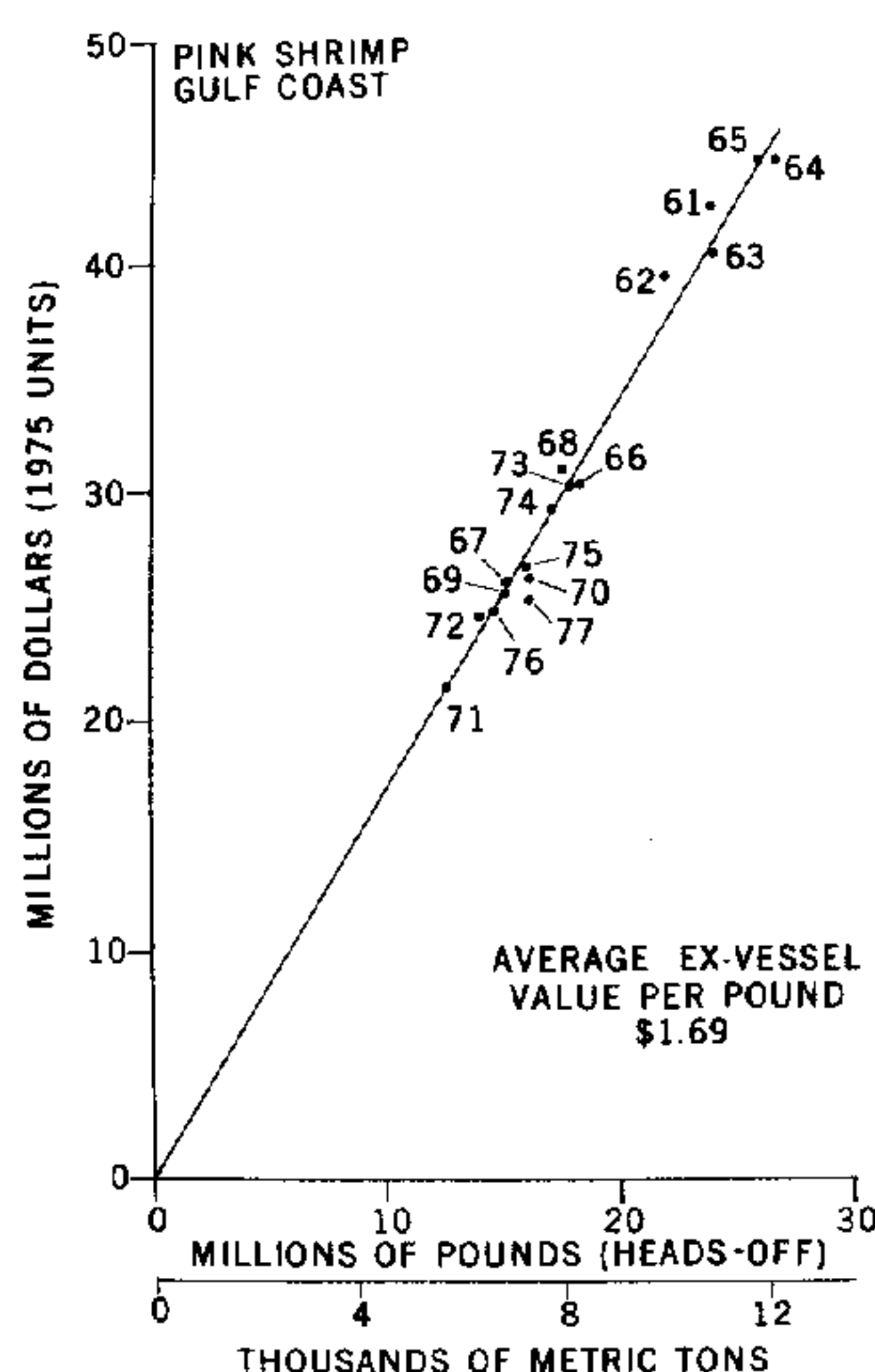


Figure 2.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the Gulf coast, 1961-77.

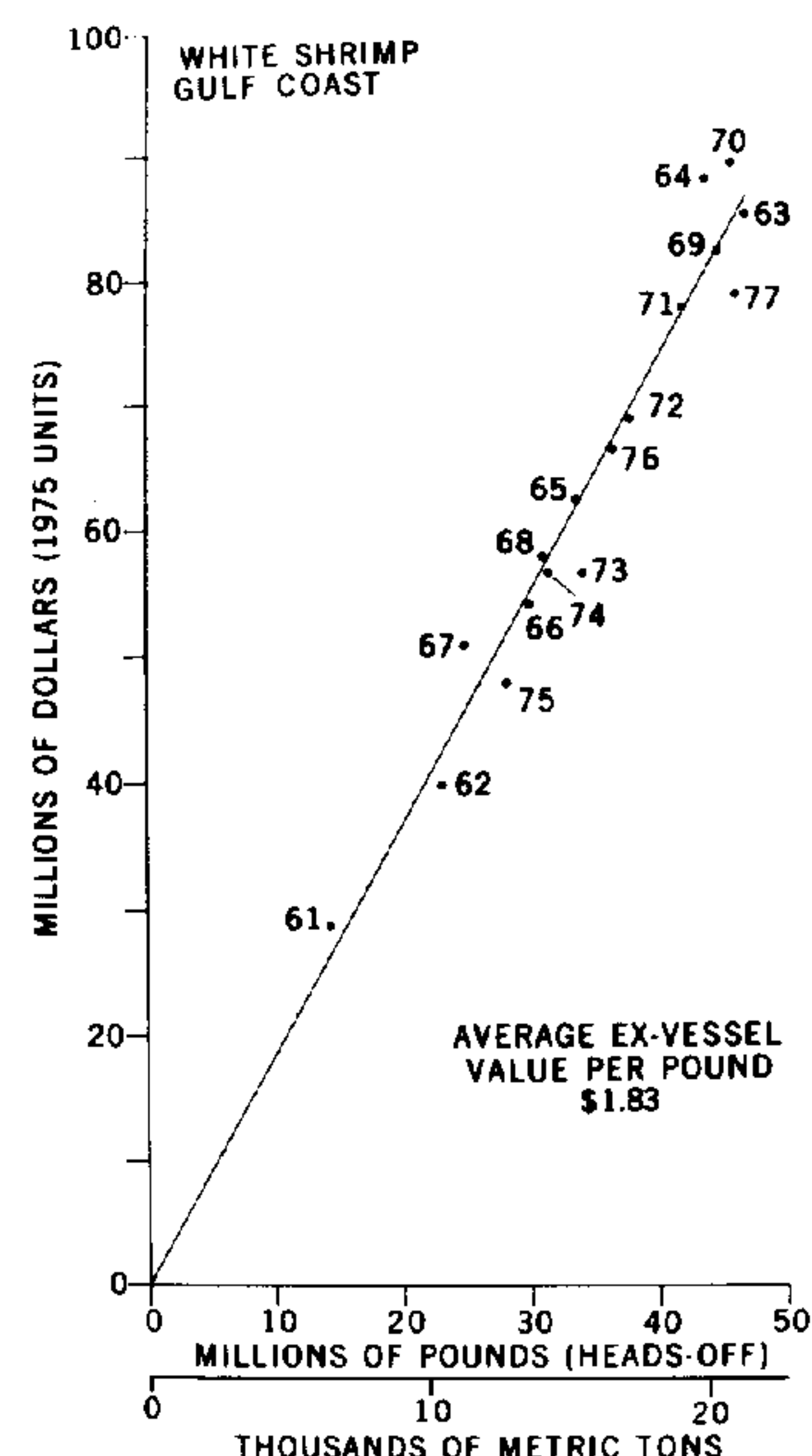


Figure 3.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of white shrimp from the Gulf coast, 1961-77.

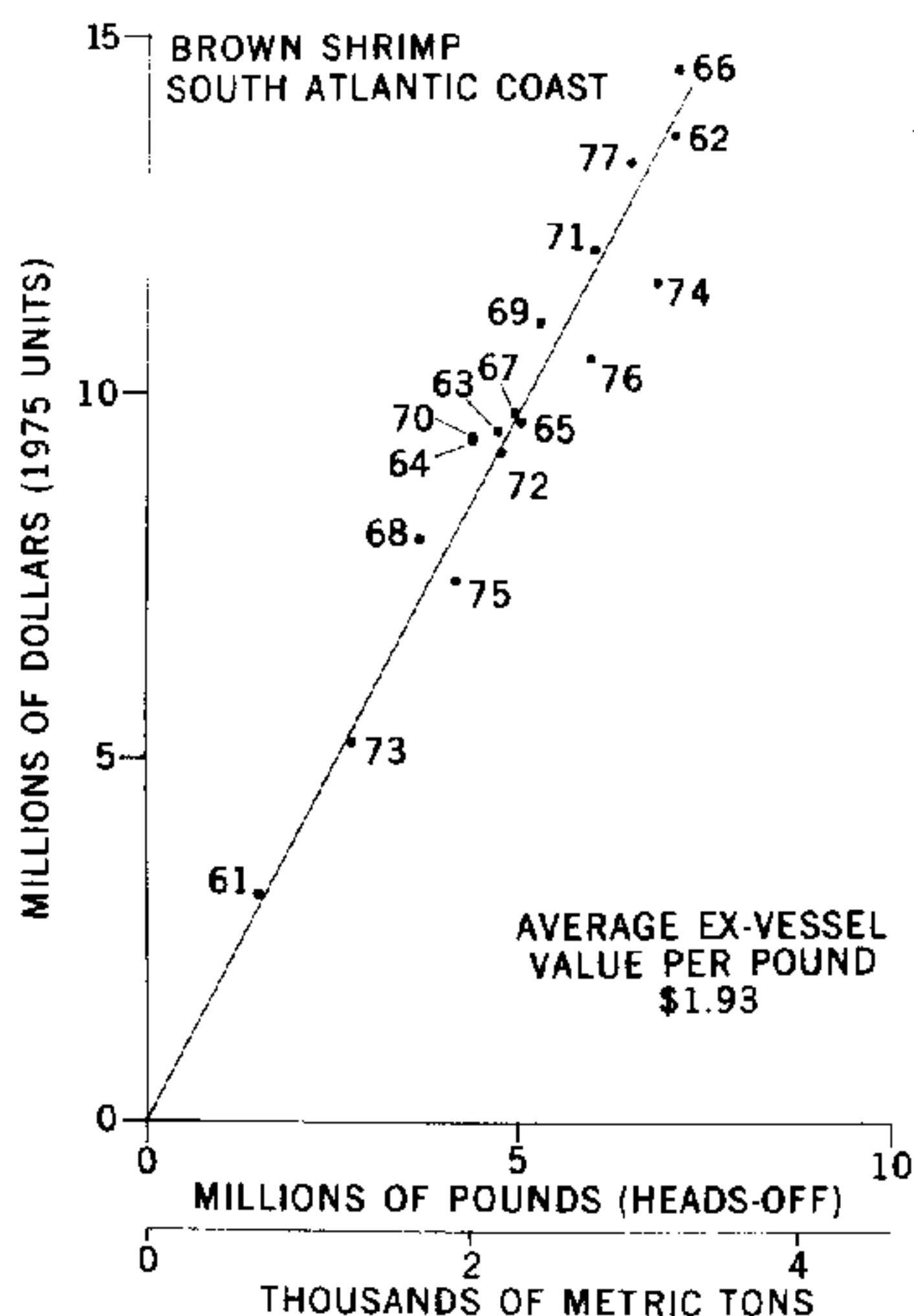


Figure 4.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of brown shrimp from the south Atlantic coast, 1961-77.

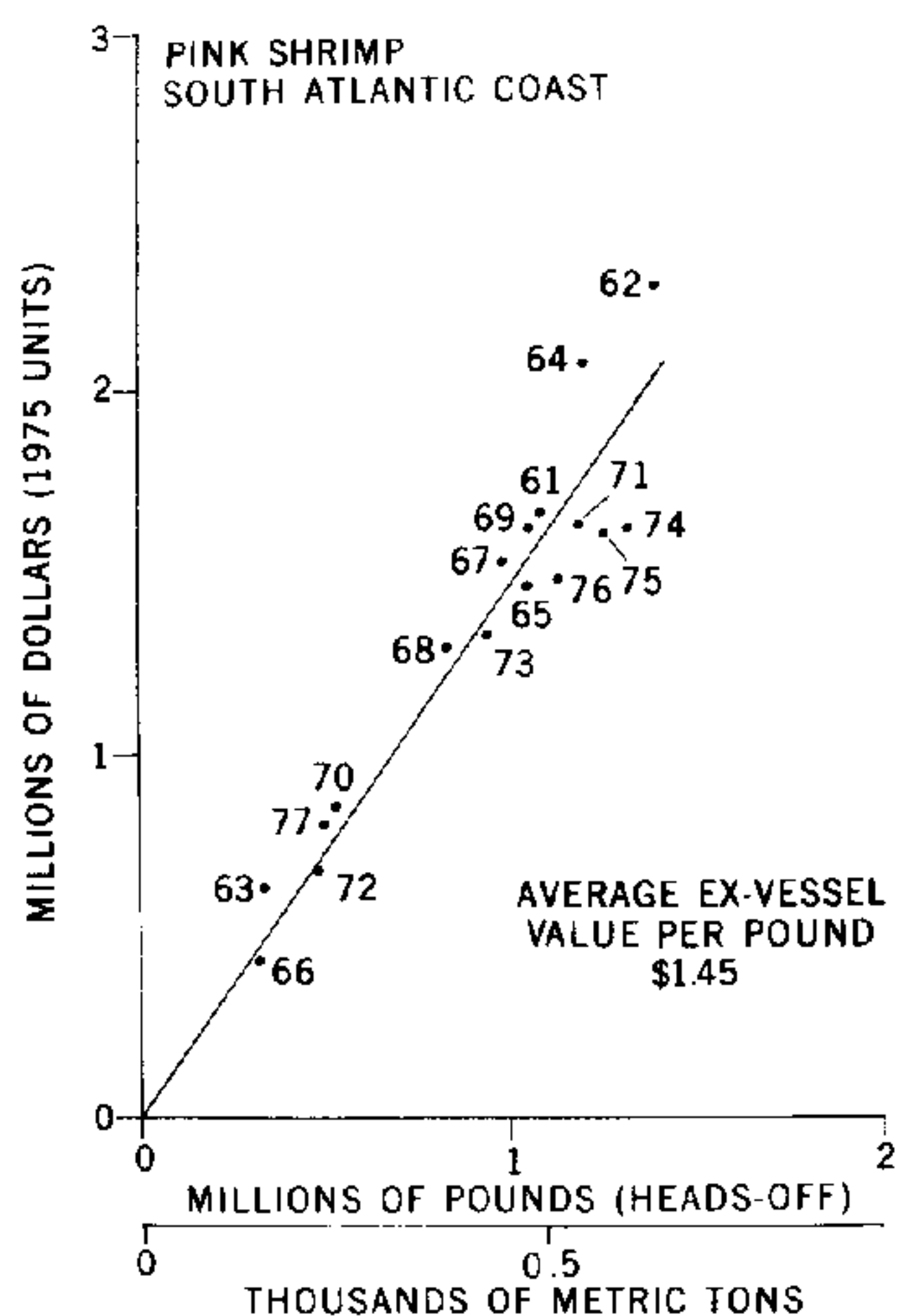


Figure 5.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the south Atlantic coast, 1961-77.

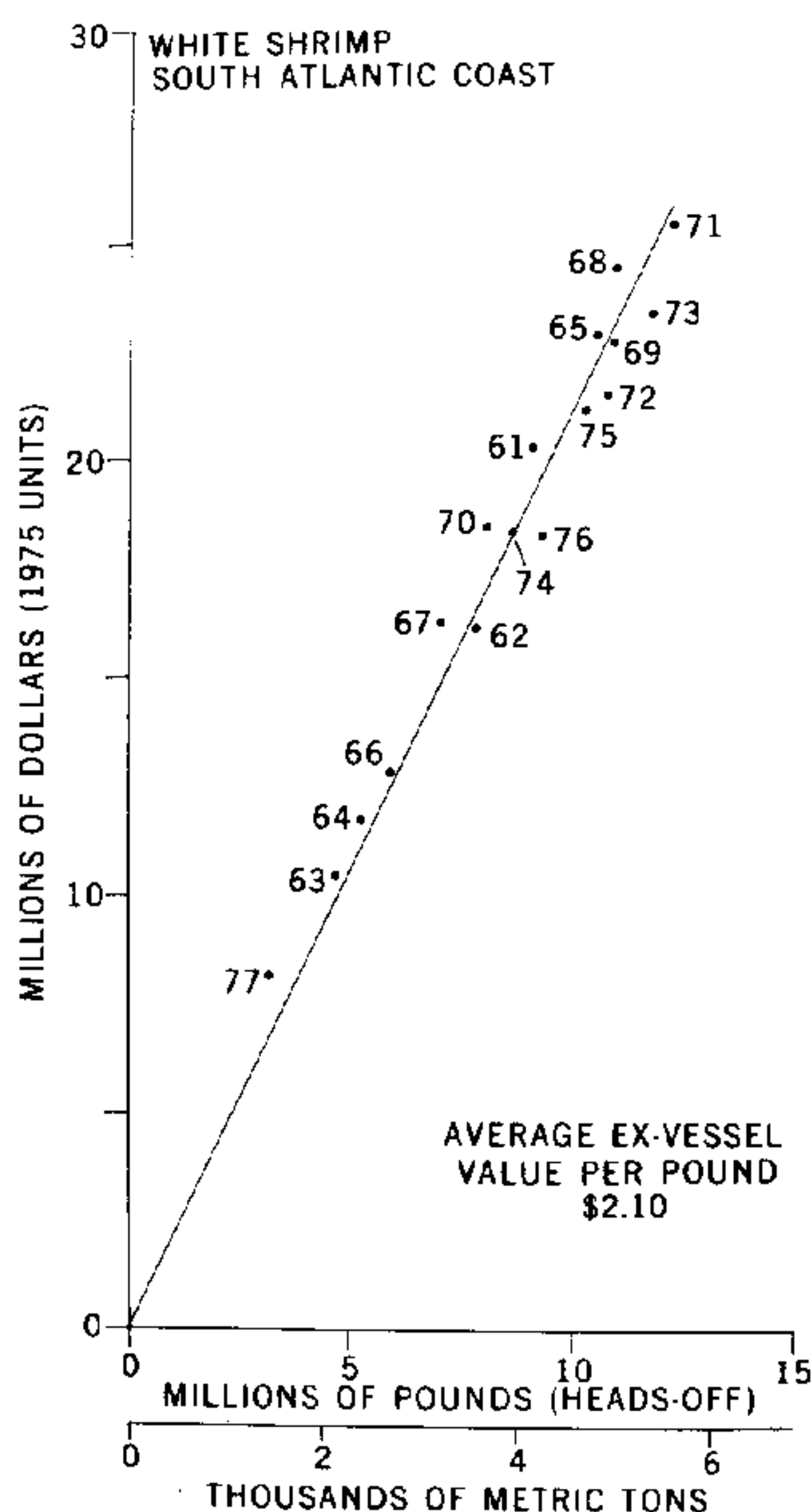


Figure 6.—Relationship between estimated annual ex-vessel value (millions of dollars in 1975 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of white shrimp from the south Atlantic coast, 1961-77.

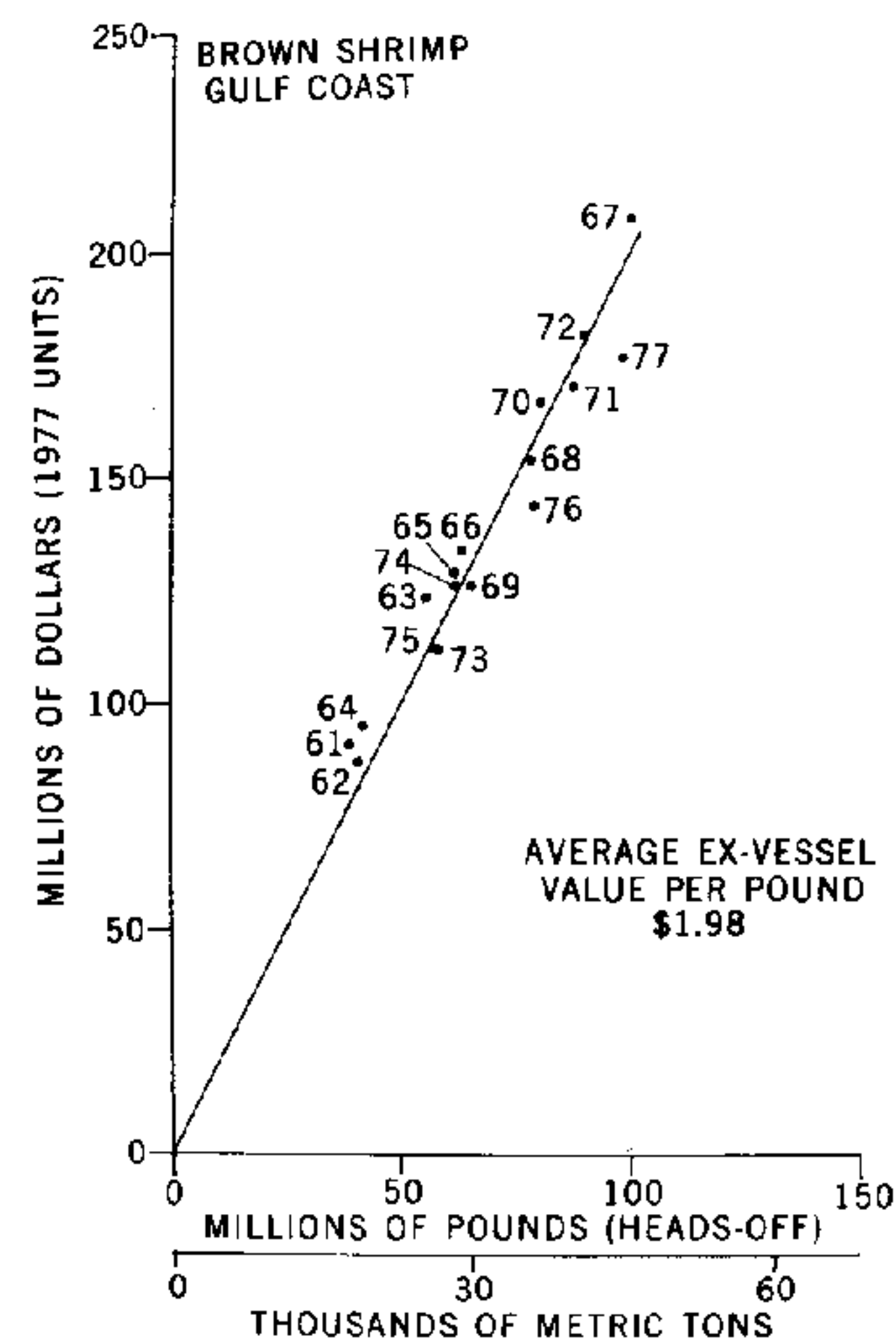


Figure 7.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of brown shrimp from the Gulf coast, 1961-77.

brown, pink, and white shrimp in 1975 nor for white shrimp in 1977, for the south Atlantic coast. This was a problem because the <15 size category did contain landings of brown shrimp in 1965, 1968, and 1977, pink shrimp in 1977, and white shrimp in 1962, 1969, and 1976 on the south Atlantic coast, requiring that such landings be included in the estimate of annual ex-vessel value for those species and years. Thus, for the south Atlantic coast, we used dollars per pound calculated for the 15-20 size category as an initial minimum approximation of dollars per pound in the <15 size category for brown, pink, and white shrimp in 1975 and for white shrimp in 1977. In this way, the approximations contributed to the estimates of annual ex-vessel value of the landings for those species and years containing

landings in the <15 size category. Then, we fitted a straight line through the origin and through the data points representing estimated annual ex-vessel value and reported annual landings, as described in the preceding paragraph, to obtain estimates of slope (average annual ex-vessel value per pound) and coefficient of determination. Thereafter, we iterated this procedure by \$0.01 increments in dollars per pound in the <15 category for brown, pink, and white shrimp in 1975 and for white shrimp in 1977, generating new estimates of annual ex-vessel value and fitting a new line through the origin and data points for each iteration, until the slope of the fitted line increased by \$0.01. In all cases, dollars per pound for the <15 size category had to be incremented to unrealistically high

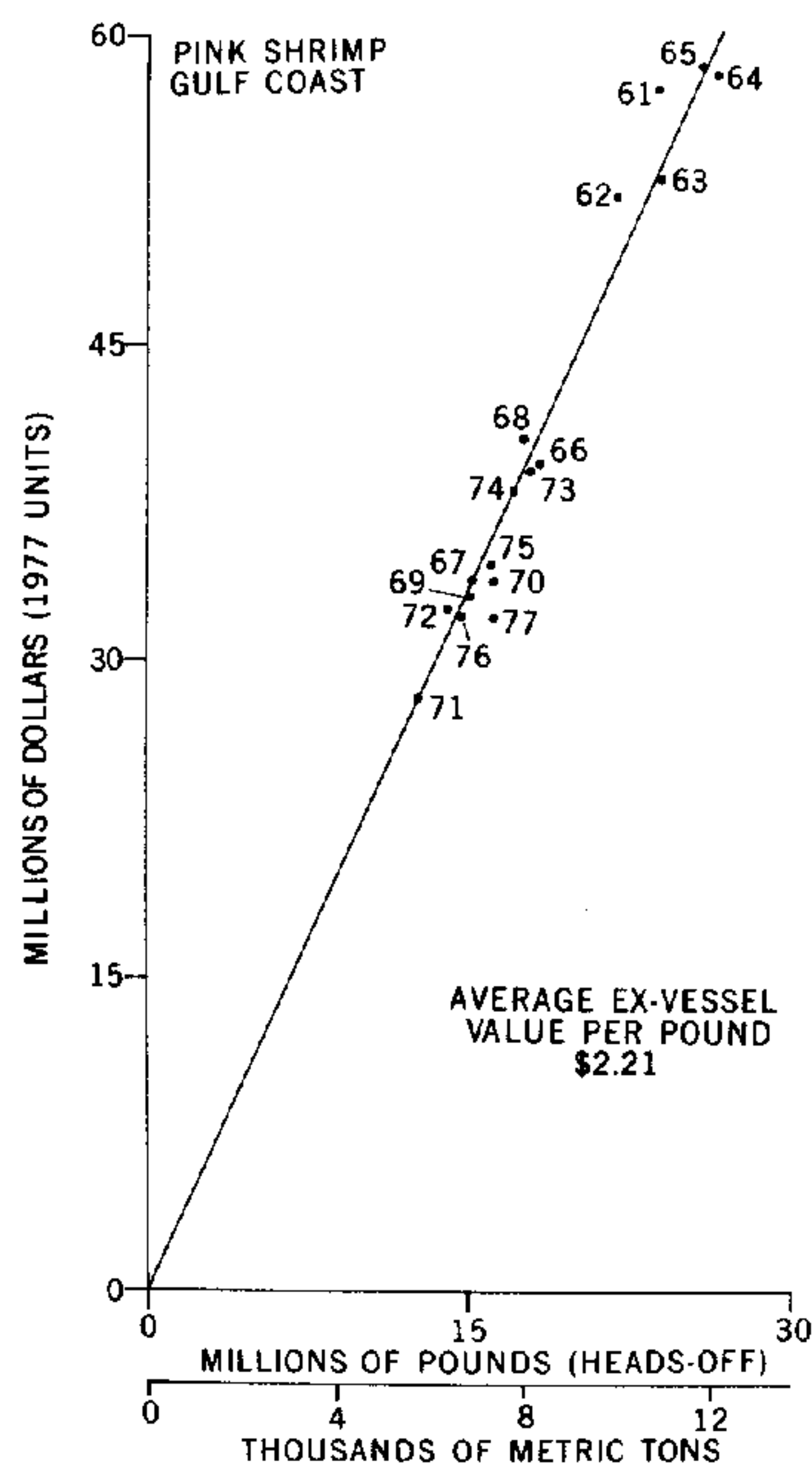


Figure 8.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the Gulf coast, 1961-77.

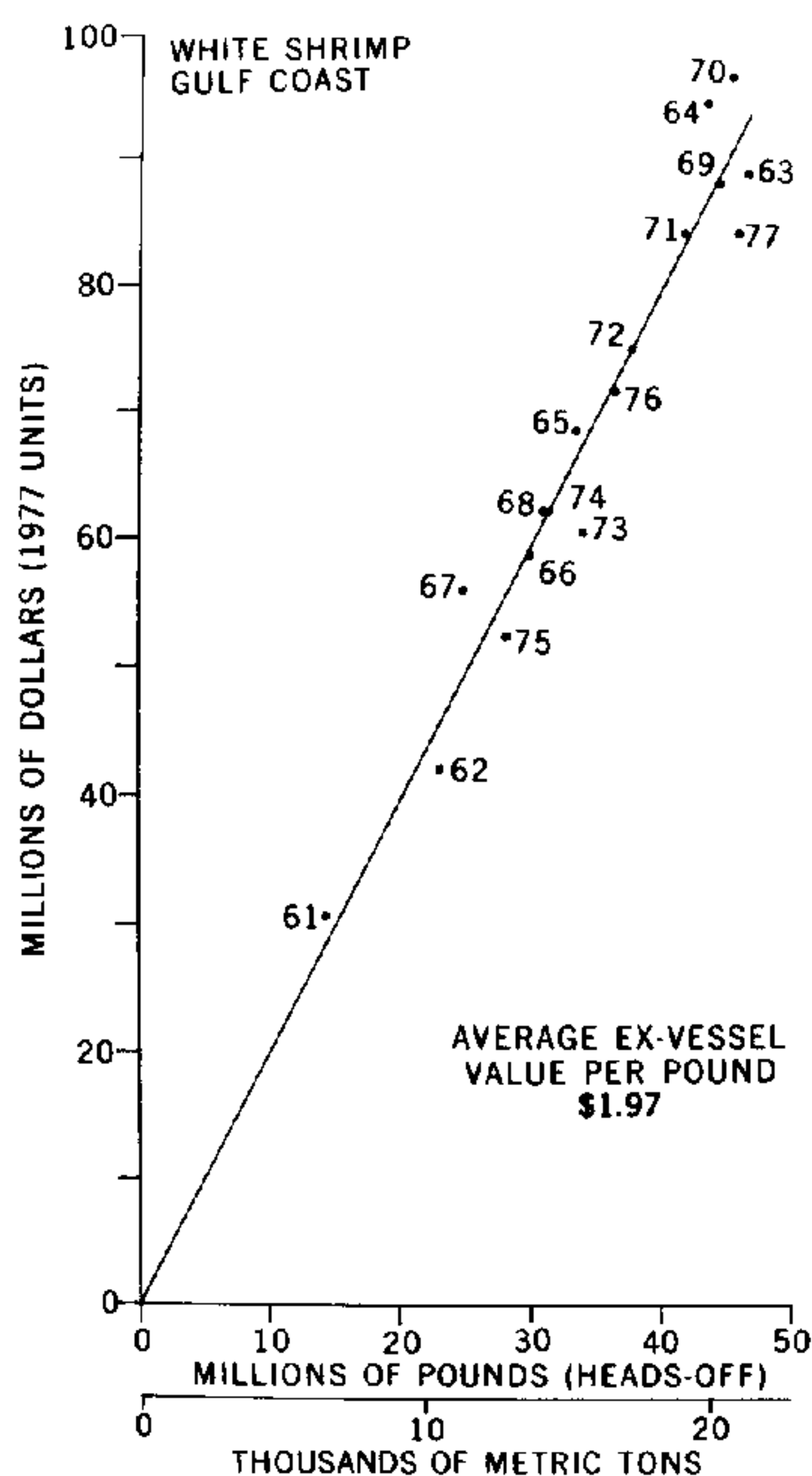


Figure 9.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of white shrimp from the Gulf coast, 1961-77.

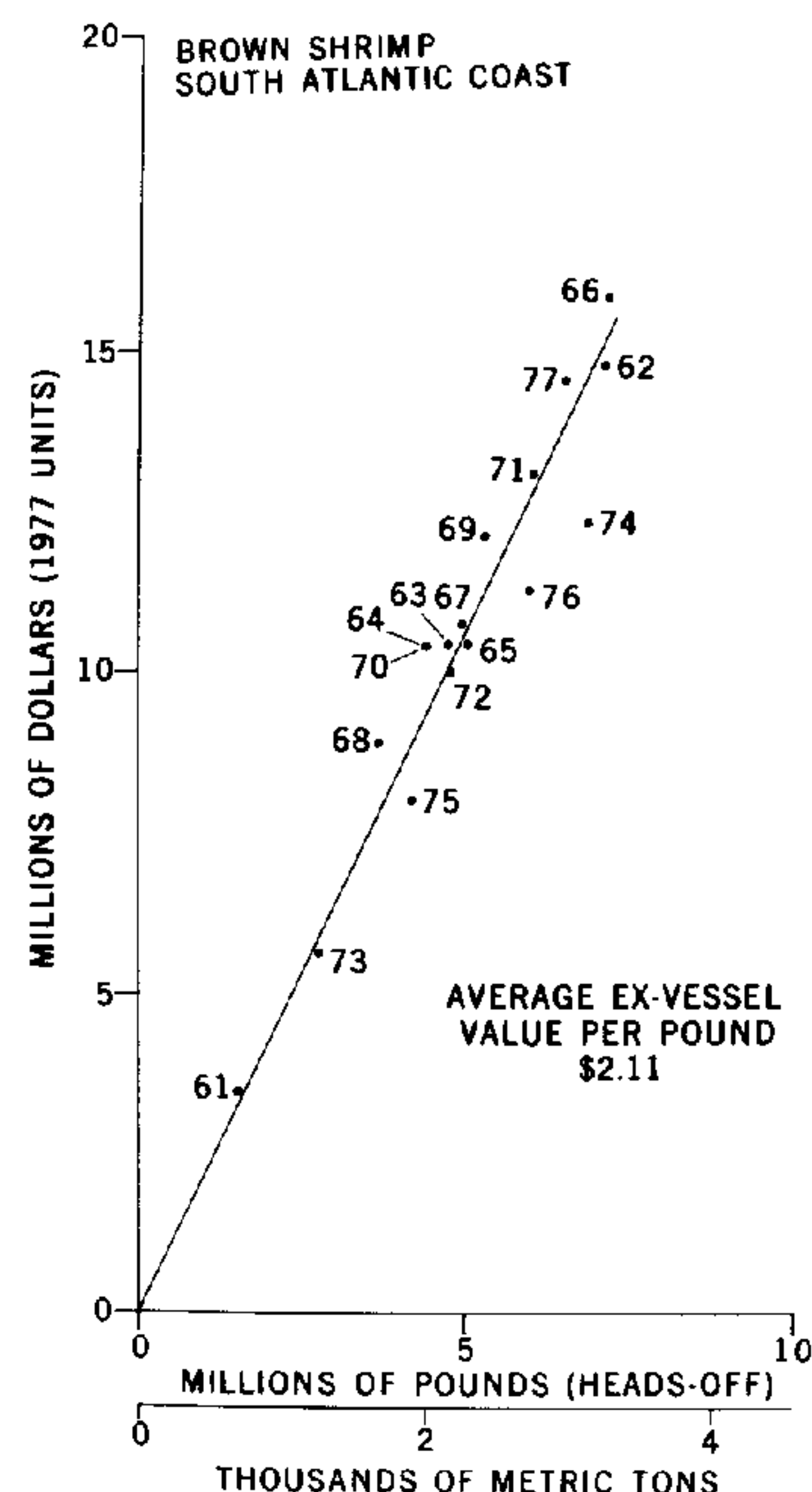


Figure 10.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of brown shrimp from the south Atlantic coast, 1961-77.

values (i.e., $\geq \$257.00$ per pound) before the slope of the line changed by \$0.01. Therefore, in the few cases in which the <15 size category contained landings, these landings were too low to cause a \$0.01 change in the slope of the least squares line until the dollars per pound for the <15 size category was incremented to levels far above what they possibly could have been. Thus, the slopes calculated with initial approximations of dollars per pound in the <15 size category were considered representative (Table 3).

The size category "pieces" also was used in the estimation of annual ex-vessel value of reported annual landings. Though there were no landings reported as pieces for brown, pink, and white shrimp during 1961-77 on the south Atlantic coast or during 1961-69

on the Gulf coast, some landings were reported as pieces for all three species on the Gulf coast during 1970-77. Thus, there was no contribution by pieces to the weight or value of the annual landings for the south Atlantic coast, and dollars per pound of pieces could be calculated for 1975 and 1977 for all species on the Gulf coast. Pieces were not included in the calculation of percentages shown in Tables 4-9, because it was assumed that the pieces represent all size categories in proportion to their percentage contribution to the landings.

The use of price structures (ex-vessel value per pound by size category, Table 2) for 1975 and 1977 provided comparisons among species and between coastal areas based upon price structures of two recent years. Because price

structure was calculated separately for each species and coastal area, any differences we showed among species and between coastal areas, in the slope of the relationship between estimated annual ex-vessel value and weight of reported annual landings (Table 3), were determined by the combined effects of size composition of the landings (Tables 4-9) and the price structure for each species and coastal area (Table 2).

Discussion

For brown and white shrimp, the average annual ex-vessel value per pound was higher on the south Atlantic coast than on the Gulf coast, based both on 1975 and 1977 dollar units (Table 3). This reflected the differences between Gulf and south Atlantic coasts in size composition and price structure of

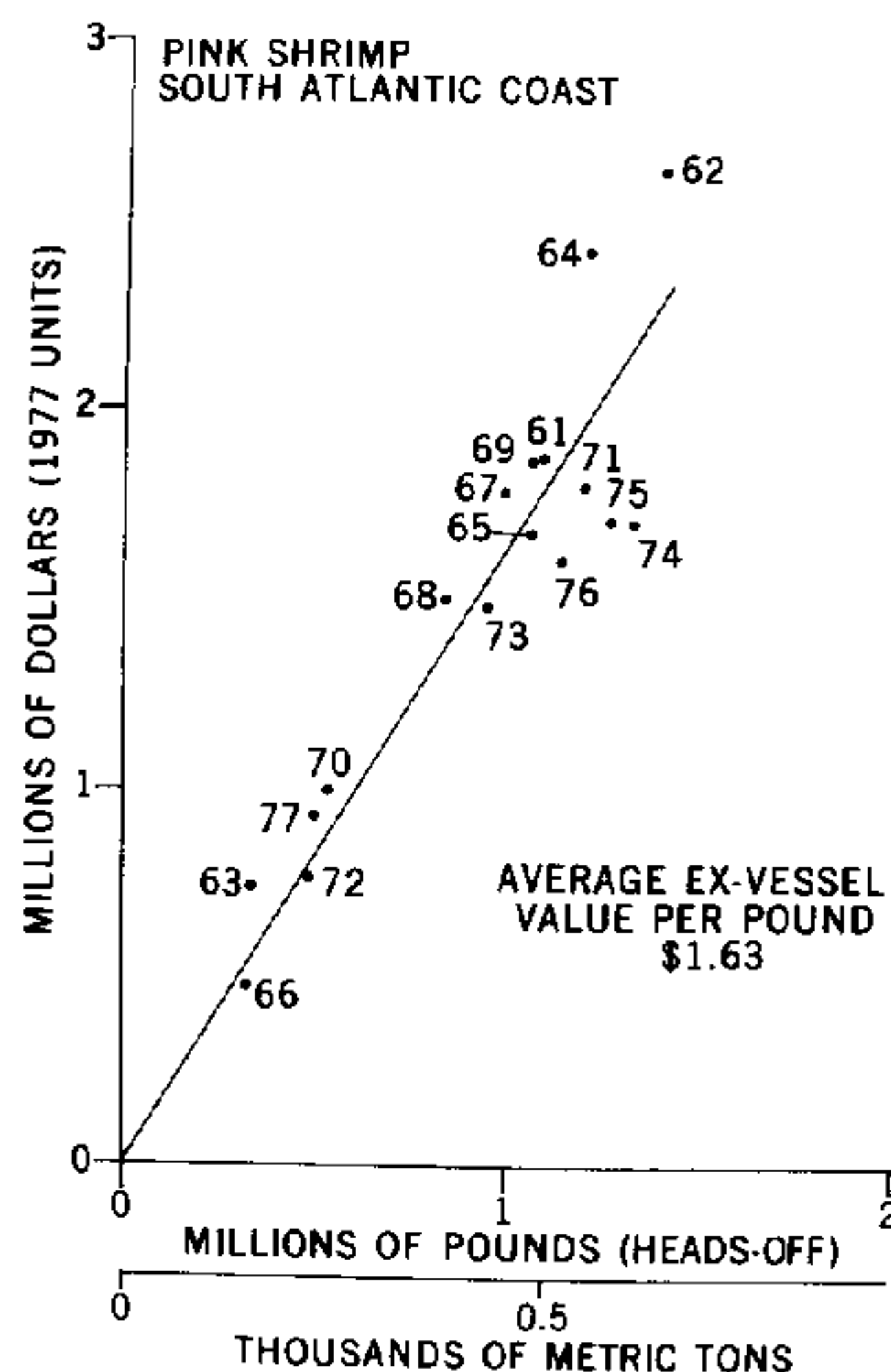


Figure 11.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of pink shrimp from the south Atlantic coast, 1961-77.

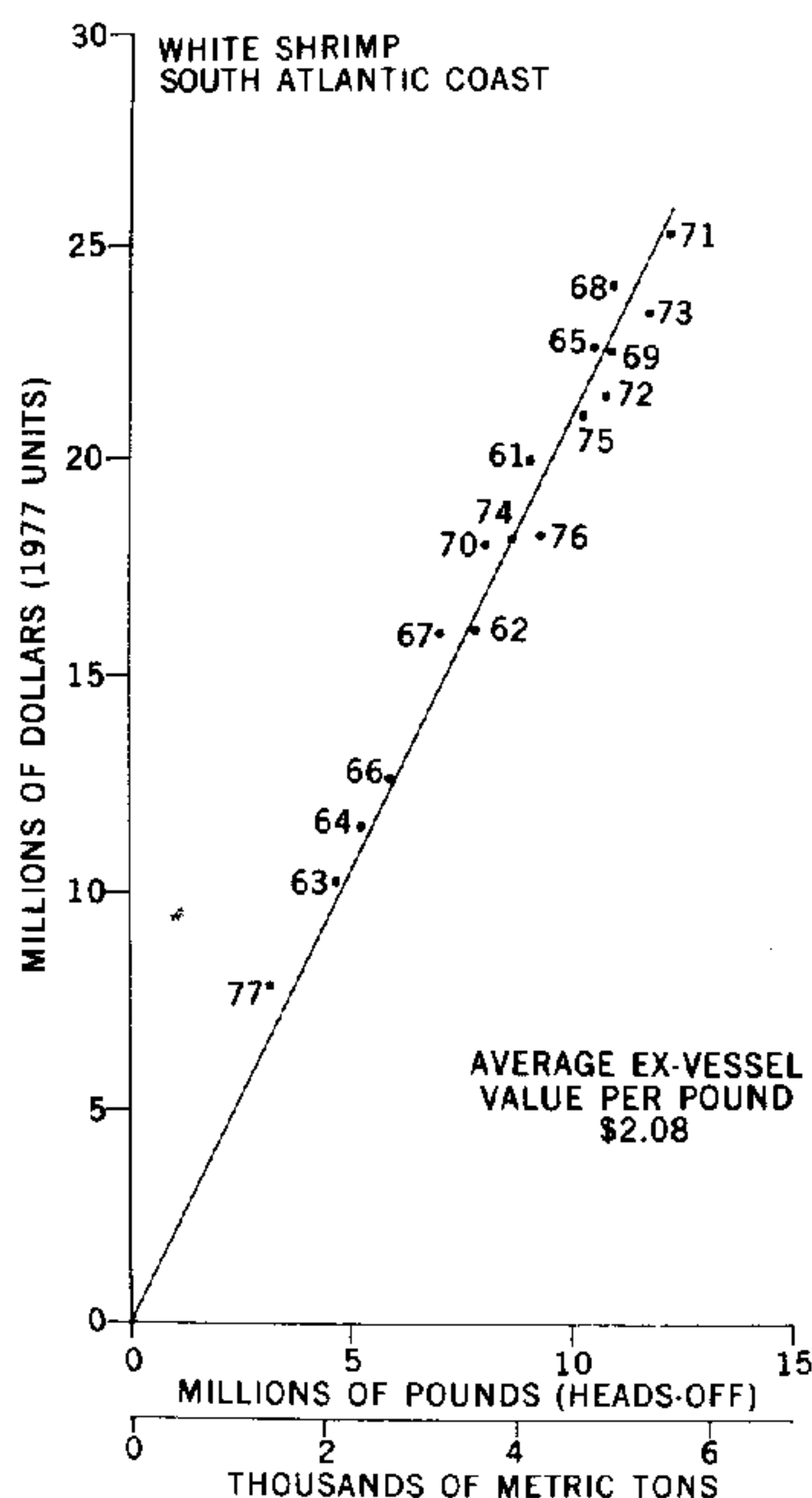


Figure 12.—Relationship between estimated annual ex-vessel value (millions of dollars in 1977 units) and reported annual landings (millions of pounds or thousands of metric tons, heads-off) of white shrimp from the south Atlantic coast, 1961-77.

the annual landings of brown and white shrimp (Tables 2, 4, 6, 7, 9). On the south Atlantic coast, the landings of brown and white shrimp contained larger proportions of intermediate size shrimp than did landings from the Gulf coast. For pink shrimp, the average annual ex-vessel value per pound was lower on the south Atlantic coast than on the Gulf coast (Table 3), reflecting the greater proportion of larger shrimp in the landings from the Gulf coast (Tables 5, 8).

While the average annual ex-vessel value per pound for brown and white shrimp was higher on the south Atlantic coast than on the Gulf coast (Table 3), the combined annual landings of brown, pink, and white shrimp were about 15 times greater on the Gulf coast than on the south Atlantic coast. This, coupled

with the fact that the average annual ex-vessel value per pound for pink shrimp was higher on the Gulf coast than on the south Atlantic coast (Table 3), made the total ex-vessel value of the Gulf coast shrimp landings substantially greater than that of the south Atlantic coast shrimp landings.

As expected, due to inflation, the average annual ex-vessel value per pound based upon 1977 dollar units was higher than that based upon 1975 dollar units for all combinations of species and coastal areas except one: White shrimp from the south Atlantic coast (Table 3). In general, there was a larger increase in value per pound for larger shrimp than for smaller shrimp; however, the value per pound decreased slightly in some instances from 1975 to 1977 (Table 2). For white shrimp on the south Atlantic coast, between 1975 and 1977, the ex-vessel value per pound

increased only slightly for some size categories and decreased for others (Table 2). Both the total annual landings of white shrimp and the range of variation in these landings on the south Atlantic coast were much smaller than those for white shrimp on the Gulf coast (Fig. 3, 6, 9, 12). For these reasons, the change in price structure of white shrimp on the south Atlantic coast between 1975 and 1977 did not produce an increase in average annual ex-vessel value per pound.

Regional differences in price structure and size composition of annual landings of shrimp play large roles in determining the ex-vessel value of a given weight of landings. Because differences in size composition of the landings reflect regional differences in shrimp laws and harvesting strategies as well as possible differences in shrimp growth and natural mortality (Christmas and Etzold, 1977; McCoy, 1972), it is tempting to speculate that the ex-vessel value per pound of landings could be increased by altering shrimp harvesting strategies to increase the size of shrimp in the landings.

Literature Cited

- Caillouet, C. W., and F. J. Patella. 1978. Relationship between size composition and ex-vessel value of reported shrimp catches from two Gulf Coast States with different harvesting strategies. *Mar. Fish. Rev.* 40(2):14-18.
- _____, _____, and W. B. Jackson. 1979. Relationship between marketing category (count) composition and ex-vessel value of reported annual catches of shrimp in the eastern Gulf of Mexico. *Mar. Fish. Rev.* 41(5-6):1-7.
- Calder, D. R., P. J. Eldridge, and E. B. Joseph. 1974. The shrimp fishery of the southeastern United States: A management planning profile. S.C. Mar. Resour. Cent. Tech. Rep. 5, 229 p.
- Christmas, J. Y., and D. J. Etzold. 1977. The shrimp fishery of the Gulf of Mexico United States: A regional management plan. Gulf Coast Res. Lab., Ocean Springs, Miss., 128 p.
- Gunter, G., and K. McGraw. 1973. Some analyses of twentieth century landing statistics of marine shrimp of the south Atlantic and Gulf states of the United States. *Gulf Res. Rep.* 4:191-204.
- McCoy, E. G. 1972. Dynamics of North Carolina commercial shrimp populations. N.C. Dep. Nat. Econ. Resour., Spec. Sci. Rep. 21, 53 p.
- National Marine Fisheries Service. 1962-76. Shrimp landings, annual summaries 1961-1975. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Curr. Fish. Stat. 2957-6924, var. pag.
- U.S. Fish and Wildlife Service. 1962-71. Shrimp landings, south Atlantic and Gulf coasts, 1961-1969. U.S. Dep. Inter., Fish Wildl. Serv., Curr. Fish. Stat. 2957, 3247, 3520, 3785, 4113, 4415, 4775, 5132, and 5407, var. pag.